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A NEW PLEUROTHALLIS FROM COSTA RICA

BY
OAKES AMES

THE species described below is in part characterized by the non-resupinate flowers; the connate lateral sepals being directed toward the apex of the leaf. In the collector's notes there is nothing to warrant the explanation that this condition is the result of the stems and leaves having been drooping or pendent, but it is probable that the leaves hung downward or were strongly deflexed, in which case the flowers would become non-resupinate.

Pleurothallis fantastica is without close allies in the Central American flora. In habit it suggests *P. Tonduziana* Schltr., but in floral structure is quite distinct; furthermore, the secondary stems are less markedly ancipitous or winged below the triangular-lanceolate leaf-blade. The adnate peduncle, the conspicuously three-lobed labellum with a more or less prominent cushion-like callus on the disc at the base of the middle-lobe, and the leaves being penninerved near the base constitute the more important distinguishing characters. The column is of the type characteristic of *Pleurothallis* as originally defined by Robert Brown, in that the stigmas are confluent along the frontal margin of the androclinium as in *P. ruscifolia* (Jacq.) R. Br. (Cf. Bot. Mus. Leafl. Harv.

EXPLANATION OF THE ILLUSTRATION

PLEUROTHALLIS FANTASTICA *Ames*. Plant, one half of natural size, drawn from the type. 1, flower, much enlarged. 2, leaf and inflorescence, natural size. 3, labellum, enlarged, lateral lobes deflexed. 4, labellum and column (anther removed), enlarged. 5, column (anther removed) showing the triangular rostellum overhanging the stigmatic orifice. 6, pollinia, very much enlarged. Floral analyses drawn from material preserved in alcohol.

Drawn in August 1936 by **BLANCHE AMES**

PLEUROTHALLIS *fantastica* Ames



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Pleurothallis fantastica *Ames sp. nov.*

Radices fibratae, albidae, glabrae. Caules secundarii congesti, valde elongati, graciles, paucivaginati, superne leviter ancipiti, monophylli. Vaginae tubulatae, valde adpressae. Folium triangulari-lanceolatum, prope basim penninervium, usque ad apicem angustatum, apice mucronatum. Pedunculi abbreviati quam folium multo breviores, folio adnati. Pedicelli fasciculati. Flores succedanei. Sepala lateralina in laminam ellipticam connata. Sepalum dorsale anguste ellipticum. Petala late lanceolata, trinervia. Labellum carnosum, trilobatum; lobi laterales semiorbiculares, plus minusve erecti; lobus medius quadratus, papillosus, prope basim callo ornatus. Columna generis. Pollinia duo.

Roots fibrous, whitish, smooth, about 1 mm. thick. Secondary stems 10–20 cm. long, about 1 mm. in diameter, crowded on a creeping rhizome, ascending, slender below, becoming slightly ancipitous above, but not so conspicuously so as in the closely related *P. Tonduziana*, clothed with several closely appressed, cylindrical sheaths, monophyllous. Leaves 10–17 cm. long, 1.5–2.5 cm. wide near the base, coriaceous, tapering gradually to an acute, mucronate tip, penninerved for the length of the adnate peduncle, the basal margins more or less involute. Peduncle about 2 cm. long, completely adnate to the leaf, bearing at the free end an ample sheath which is about 6 mm. long and from which one to three or more non-resupinate flowers emerge in succession, only one flower, rarely two, being expanded simultaneously. Pedicels fasciculate, about 3 mm. long, smooth. Ovary 3.5 mm. long, jointed to the pedicel. Lateral sepals connate, forming an elliptical lamina with eight nerves, 5 mm. long, about 4 mm. wide. Upper sepal 5–6 mm. long, 3 mm. wide,

narrowly elliptical, obtuse or subacute, 3-5-nerved. Petals 5-6 mm. long, 2 mm. wide, broadly lanceolate, minutely glandulose, obtuse, 3-nerved. Labellum fleshy, adnate below to the base of the column and emerging just above its base, 2 mm. long, about 3 mm. wide, conspicuously fleshy, three-lobed with the lateral lobes semi-orbicular, about 2.5 mm. long, about 1 mm. wide, minutely glandulose, obliquely erect and more or less appressed to the column; middle lobe 1 mm. long and about 1 mm. wide, quadrate, retuse, distinctly glandulose, purplish, 3-nerved with a bilobed or retuse callus at the base. Column about 3 mm. long, narrowed toward the middle, conspicuously dilated above, minutely glandulose; rostellum broadly triangular. Pollinia two, slenderly pyriform.

COSTA RICA: Province of San José, in the vicinity of El General. Epiphyte on trees by a river at 830 meters altitude. Flowers yellow. January 1936. *Alexander F. Skutch 2391*. (Type in Herb. Ames No. 43650). In the dried flowers examined the sepals and petals were yellow, the labellum purplish.

A RARE SOBRALIA FROM COSTA RICA

BY

OAKES AMES

Sobralia pleiantha *Schlechter* in Fedde Repert. 3 (1906) 79; in Fedde Repert. Beihefte 19 (1923) 81.

IN 1921, H. PITTIER discovered the type of *Sobralia pleiantha* in a forest near Boruca in southwestern Costa Rica. When Rudolf Schlechter described it, fifteen years later, he referred to the unusual nature of the inflorescence in having more than one flower expanded at a time. In *Sobralia*, usually, the flowers are produced singly, in succession, each flower remaining in perfection for a very few hours.

The plants attain a height of 8 decimeters or more, each slender stem bearing as many as ten elliptic-lanceolate, acuminate leaves which are articulated to elongated, closely appressed cylindrical, smooth sheaths. At the summit of the mature stems the flowers appear in an abbreviated raceme with complanate, distichous bracts. Each raceme produces as many as ten flowers. The lowermost flowers expand first and are in perfection while the terminal flowers are still in bud.

The sepals and petals are from 3–3.3 cm. long and about 1 cm. wide. The labellum, equally long, and about 2 cm. wide, is closely beset, along the central veins, with numerous, crowded, glandular processes. These processes are simple, bifurcate or several-times divided, those near the apex of the lamina being strongly complanate; those near the base being crowded into a pair of abbreviated keels; the margin of the labellum is finely denticulate almost to the base. The column is typical of the genus and attains a length of about 3 cm.

In the original description the labellum is described as being cuneate-obovate. In a drawing received from

EXPLANATION OF THE ILLUSTRATION

SOBRALIA PLEIANTHA Schlechter. Plant, natural size, drawn from a specimen of *Skutch 2484*. 1, label-lum about twice natural size. 2 and 3, column, enlarged. Figures 1, 2 and 3 drawn with the aid of the camera lucida from flowers preserved in alcohol.

Drawn in July 1936 by BLANCHE AMES



SOBRALIA *pleiantha* Schltr.

Dr. Schlechter the labellum is strongly cuneate below the middle. In the specimens from which the accompanying plate was drawn, the labellum is elliptical and not at all cuneate below the middle.

The flowers on the plants collected by Skutch are not resupinate, and it is highly probable that this condition is to be explained by the stems having been pendent rather than erect.

COSTA RICA: Comarca de Puntarenas, near Boruca. In a forest, at 450 meters altitude. February, 1891. *H. Pittier 3855*. (TYPE in Herb. Mus. Bot. Berol. DUPLICATE TYPE in U. S. Nat. Herb.): Province of San José, vicinity of El General. On trees, at 880 meters altitude. Flowers cream. January, 1936. *Alexander F. Skutch 2484*.

A NEW MACROSTACHYA FROM THE CARBONIFEROUS OF ILLINOIS

BY

WILLIAM C. DARRAH

ALTHOUGH an extensive literature concerning calamarian cones has been developed during the past fifty years, only meager information about *Macrostachya* is available. Well-preserved specimens of cones of fossil plants are rather rare, and frequently the fragmentary nature of larger forms makes investigation difficult. *Macrostachya* belongs to articulated plants remotely related to living Equisetales.

The specimen described in this study was collected in the strippings of the Wilmington mines, Will County, Illinois. These coal workings are an extension of the "Mazon Creek" beds. The specimens occur in typical iron-stone nodules. Mr. Frederick O. Thompson, the collector and donor, has presented his extensive collections to the Botanical Museum of Harvard University. Mr. Thompson has succeeded in gathering 11,000 specimens from Will County, and although calamarian cones are relatively common only two are referable to *Macrostachya*.

The complete specimen, number 15602, was first studied in the round, and then investigated by the "peel" method.

This peel method may be described briefly. The surface of the specimen is washed carefully with water and then is etched with a two percent solution of hydrochloric acid. Following the application of acid, the surface is again washed with water in order to remove excess acid and salts in solution. After the specimen is dry, a solution of nitrocellulose in butyl acetate is poured over the etched surface. Within six hours the nitrocellulose hard-

ens into a tough, pliable, permanent, transparent film. This film or "peel" is peeled away from the specimen. The dried peel contains a replica of the cellular detail which is composed of black or brown carbon from the original cellulose. Desired portions are mounted, unstained in the usual cytological method, with balsam in xylol. Such preparations may be studied with a magnification up to 1000 diameters.

Numerous peels can be made on a single specimen without destroying the specimen itself. In this study eight peels were made from the holotype.

In general practice all macrostachyan cones of large size and compact whorls are identified with *Macrostachya infundibuliformis* (Brongniart) Schimper. The species is not only poorly defined, but also so broadly interpreted that several different species are included in it. Despite this confusion it was evident at once that the specimens from Illinois were distinct. The whorls contain 30 to 36 sterile bracts, whereas *Macrostachya infundibuliformis* contains only 20. In addition, the sporangia contain large isospores, whereas *M. infundibuliformis* is believed to be heterosporous. There are other specific differences such as the shape of the bracts and the proportions of the cone. There is no reason for the establishment of a new generic designation.

MACROSTACHYA *Schimper*

Traité de Paleontologie végétale vol. 1. p. 332.
1869.

Macrostachya Thompsonii *Darrah sp. nov.*

Cone large, 210 mm. long; whorls 5-7 mm. apart, except at apex where they are compact; each whorl is composed of 30-36 bracts; there are 50-53 whorls; each bract is mucronate with 1, 2, and even 3 teeth. Sporangia are borne as in *Calamostachys*. The plant is isosporous.

rous; the large spores measure 350–400 μ . in diameter; usually collapsed; smaller, undernourished spores occasionally present. Shape of the cone elongate, expanding from a pedicle 6 mm. wide, gradually to 30 mm. in the middle third, continuing until near the apex where it tapers suddenly to a rounded summit.

I have the honor to name this specimen *Macrostachya Thompsonii* in recognition of Mr. Thompson's continued interest in paleobotany and his generosity to the Botanical Museum of Harvard University.

Lesquereux believed that *Macrostachya infundibuliformis* occurs in the Mazon Creek flora. His specimen is a poorly preserved *Macrostachya Thompsonii*. Lesquereux¹ figured a specimen from Cannelton, Beaver County, Pennsylvania as *M. infundibuliformis*. It differs from Brongniart's² species but falls within the concept of Schimper³. It is probably an unnamed species. Nothing is known of its internal structure, so that a new name would not help the problem. Lesquereux also united with Schimper's *M. infundibuliformis*, *Asterophyllites tuberculata* Lesquereux⁴, and *Asterophyllites aperta* Lesquereux⁵. Both of these species are probably valid.

The most comprehensive discussion of *Macrostachya*, especially *M. infundibuliformis* is to be found in the monograph on Steinkohlen-Calamarien by Weiss⁶. Figure 1 on plate VI is frequently copied by paleobotanists (Gothan⁷, Scott⁸) and is considered to be the "typical" form

¹ Lesquereux: Coal Flora, p. 60. pl. 13. f. 17. 1879.

² Brongniart: Histoire Vég., foss. p. 119. pl. 12. f. 14–16. 1828.

³ Schimper: Paleontologie Végétale, v. 1. p. 333. 1869.

⁴ Lesquereux: Geol. Penna., p. 852. 1858.

⁵ Lesquereux: Geol. Penna., p. 852. pl. 1. f. 4. 1858.

⁶ Weiss: Steink. Calam., p. 71. pl. 6. f. 1–4. 1876.

⁷ Gothan: Leitfossilien III, p. 117. f. 102. 1923.

⁸ Scott: Studies, 3rd. Ed., v. 1. p. 65. f. 33. 1920.

of the species. On plate XVIII, figures 1, 3, and 4, Weiss illustrates a slender, lax variety called *Solmsii*. However, its reference to *Macrostachya infundibuliformis*, even as a variety is rather dubious. Certainly the robust *Macrostachya Thompsonii* with its thickened bracts is distinct.

Bischoff⁹ figured a poor specimen from Bronn's collection under the name of *Equisetum infundibuliforme*. It is not referable to *Macrostachya infundibuliformis*. In the collections of the Botanical Museum, there are three specimens from Bronn's collection (number 10432). They are the type specimens.

Their identity is authenticated by the following data on Bronn's original label:

Equisetum infundibuliforme Bronn et Bischoff 1827
Steinkohlengebirge, St. Ingbert's.

As Weiss¹⁰ suggested they belong to *Cingularia typica* Weiss. Incidentally in a foot-note (loc. cit. p. 93) he says "Das Original soll mit der Bronnschen Sammlung nach dem Tode des Besitzers nach Amerika gewandert sein." Bronn's collection was purchased by Harvard University in 1859.

Brongniart¹¹ published a description of *Macrostachya infundibuliformis* under the name of *Equisetum infundibuliforme*. He extended Bronn's concept to include what subsequently became known as the "typical" plant. Brongniart's memoirs were widely used, while Bischoff's paper escaped the notice of most paleobotanists. Thus Brongniart's *E. infundibuliformis* is conserved, although Bronn's species has priority. Thus the correct designa-

⁹ Bischoff: Krypt. Gewächse, p. 52. pl. 6. f. 4. 1828.

¹⁰ Weiss: Steink. Calam., 1876.

¹¹ Brongniart: Hist. Vég. foss., p. 119. pl. 12. f. 14-16. 1828. f. 14 is a copy of Bronn's type.

tion is *Macrostachya infundibuliformis* (Brongniart, non Bronn) Schimper.

The identity of *Macrostachya infundibuliformis* is further complicated by the dual interpretation of Renault¹². Renault figured an elongate strobilus with a typical incurved pedicle (pl. 18. fig. 2) but the detail is too poor to show any structure. He also figured and described (pl. 19. fig. 6, 7, 8) a specimen from Autun, France as *Macrostachya infundibuliformis*?. This specimen was sili-cified and suitable for the grinding of thin sections. From rather poor preparations he deduced that the verticils were composed of 20 bracts which are distantly placed—as much as 5 mm.—and that numerous large “macrospores” were present. Renault also included in this species numerous impressions from Permian and Upper Carboniferous deposits. There is little evidence to demonstrate that Renault’s figured specimens were identical.

Renault¹³ also studied carbonized cones of a *Macrostachya* found with *Calamites* stems in Autun. With unsatisfactory methods, he was able to show that the cone was heterosporous, with both microsporangia and megasporangia in the same strobilus. Renault’s description and interpretation is not clear. *Calamostachys Binneyana*, although homosporous, sometimes shows abortive or undernourished spores, and may give the appearance or being heterosporous. *Calamostachys Casheana* on the other hand, is heterosporous, but even in this species the same abortion of spores occurs. A similar sacrifice of certain spores is to be observed in *Macrostachya Thompsonii*.

The occurrence of large spores in *Macrostachya Thompsonii* may indicate that the plant was heterosporous, but that the microsporangia and megasporangia

¹² Renault: Cours de Bot. foss., p. 121. 1882.

¹³ Renault: Notice sur les Calamariées, pt. III. 1898.

were borne in separate cones. However, there is no evidence to support this possibility.

It will be observed that in many respects *Macrostachya Thompsonii* resembles the better-known genus *Calamostachys*. At the same time the gross appearance of the cone is very unlike the smaller, lax, not imbricated *Calamostachys*.

Huttonia spicata Sternberg¹⁴ is in general form similar to *Macrostachya*. In its structure, however, it appears to be a typical *Palaeostachya*¹⁵. The resemblance of *Macrostachya* to structural plans known under other generic names, may indicate that *Macrostachya* is an unnatural group of large cones of which no structure is known. In this case, as soon as internal anatomy is known, the several species would be transferred to either *Calamostachys* or *Palaeostachya*. This is probably an extreme view which cannot be defended.

In the recent discussions of the phylogeny of the sphenopsids or articulates (Browne¹⁶, Zimmerman¹⁷) no mention is made of *Macrostachya*. It will be seen from the foregoing account that *Macrostachya* in no way alters the conventional interpretations concerning the calamarian cone.

At this time it is not possible to determine the parent-plant of *Macrostachya Thompsonii*. Among the Mazon Creek plants there are many detached parts of *Calamites*. All of the calamarian cones (*Macrostachya*, *Calamostachys*, *Palaeostachya*, *Cingularia*) are borne by *Calamites*. The following "species" are known from the Mazon Creek flora:

¹⁴ Hirmer: Handbuch, p. 455. 1927.

¹⁵ Jongmans: Anleitung Bestimmung Karbonpflanzen, p. 354. 1911.

¹⁶ Browne: Ann. Bot., v. 41. p. 301-320. 1926.

¹⁷ Zimmermann: Phylogenie der Pflanzen, 1930.

EXPLANATION OF THE ILLUSTRATION

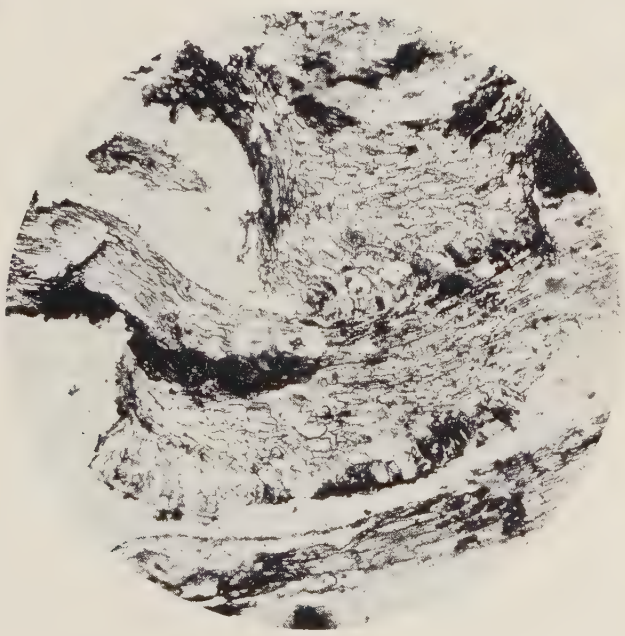
MACROSTACHYA THOMPSONII *Darrah*. Heliotype reproduction from a photograph of the type specimen, three fourths natural size. Number 15602 Botanical Museum Collection.



EXPLANATION OF THE ILLUSTRATIONS

MACROSTACHYA THOMPSONII Darrah. Figure at upper left. Heliotype reproduction of a photograph of a nitrocellulose peel from the reverse half of the type specimen, showing central axis and sterile bracts in longitudinal section at top, and numerous sporangia in the middle region. One half natural size.

Figure at lower right. Heliotype reproduction from a photomicrograph of a nitrocellulose peel from the type specimen, showing two sterile bracts and the remnants of a sporangium. Magnified 44 times.



<i>Stems</i>	<i>Foliage</i>	<i>Cones</i>
<i>Calamites Suckowii</i>	<i>Annularia stellata</i>	<i>Macrostachya Thompsonii</i>
<i>C. carinatus</i>	<i>A. radiata</i>	<i>Calamostachys Solmsii</i>
<i>C. ramosus</i>	<i>A. sphenophylloides</i>	<i>C. magna</i>
	<i>Asterophyllites equisetiformis</i>	<i>C. germanica</i>
		<i>Palaeostachya</i> sp.

In other words, there are three "species" of stems, four of foliage, and five of cones. The various "generic" designations indicated above are form-genera. In the study of fossil plants, the paleobotanist has to contend with fragmentary and detached specimens. Hence a cone will receive generic and specific names, as will a stem and a leaf-whorl. Ultimately the discovery of a more complete specimen may bring together these various parts under one "biological species." This may seem confusing, but in practice it has been useful and simple. The foliage of *Macrostachya Thompsonii* is an *Annularia*, because the *Asterophyllites* leaves from Mazon Creek belong to a *Calamostachys*, probably *C. magna*. The second specimen of *Macrostachya Thompsonii* (number 15608) is accompanied in organic attachment with a poorly preserved, slightly modified, *Annularia*—probably Jongman's *Annularia stellata americana*.¹⁸

The species here named *Macrostachya Thompsonii* is known only from the environs of Mazon Creek in Will and Grundy Counties, Illinois. It is distinct from other *Macrostachya* cones collected at Cannelton, Beaver County, Pennsylvania. The geologic age of these forms is Upper Carboniferous, Allegheny Series, Kittanning formation.

I wish to acknowledge my gratitude to Lady Isabel Browne, Professor Walter Gothan, and Professor W.J. Jongmans for their generosity in presenting to me various publications relating to this study.

¹⁸Jongmans and Gothan: Geol. Bur. Heerlen Jaarverslag 1933, p.36.

A RARE EPIDENDRUM FROM COSTA RICA

BY
OAKES AMES

THE IDENTITY of *Epidendrum incomptum* Reichb.f. remained obscure for many years following its publication in 1852, because in 1889 the Warscewicz type from Panama was sealed up in the Reichenbach Herbarium and remained inaccessible until 1914. Prior to 1914, the only available specimen on which to form a conception of the species was the Godman and Salvin plant collected in 1862 at Cobán in Guatemala, and preserved in the Kew Herbarium. This specimen was tentatively determined by Reichenbach as probably being referable to *E. incomptum*. The original description, aside from comparing the species with *E. arbuscula* Lindl., failed to clarify it sufficiently. We now know that *E. incomptum* is a native of Guatemala, Costa Rica and Panama, characterized by extreme rarity and sparse distribution.

Epidendrum incomptum *Reichenbach filius* in Bot. Zeit. 10 (Oct. 15, 1852) 733;—Lindley Fol. Orch. Epid. (1853) p. 87—Reichenbach filius in Walp. Ann. 6 (1862) 410; Beitr. Orch. Centr.-Am. (1866) 38—Hemsley in Gard. Chron. n.s., 11 (1879) 367; in Godman & Salvin Biol. Centr.-Am. Bot. 3 (1883) 232—Pittier in Anal. Mus. Nac. Costa Rica 1 (1887) 75—Schlechter in Beihefte Bot. Centralbl. 36, Abt. 2 (1918) 463—Ames, Hubbard & Schweinfurth Genus *Epidendrum* (1936) 108.

Plants much branched; conspicuously sheathed, with two to three approximate, alternate leaves on the upper part of each branch; floriferous branches 3–35 cm. long. Leaves oblong-elliptic, 8.5–12.5 cm. long, 2.5–3.2 cm. wide. Racemes terminal, lax, 4–15 cm. long, bearing from three to twenty distichously arranged, fleshy, green-

ish flowers. Lateral sepals acinaciform, 1.3 cm. long, 6 mm. wide. Upper sepal lanceolate, 1.2 cm. long, 4.5 mm. wide above the middle. Petals narrowly spathulate, 11.5 mm. long, about 1.5 mm. wide. Labellum adnate to the column, about 1.5 cm. long, free portion 7–8 mm. long, 1.3 cm. wide, about equally three-lobed with the lateral lobes divaricate, rounded; mid-lobe triangular, acute, sharply deflexed at the apex; ecallose or faintly verruculose on the mid-nerve. Column 9–11 mm. long; anther fleshy, 2-celled (each cell divided by a septum), minutely glandular-fringed in front; pollinia four, complanate.

GUATEMALA: Department of Alta Verapaz, Cobán, 1862. *Godman & Salvin* 410.

COSTA RICA: Province of Cartago, La Estrella de Cartago. Raceme pendent; flowers succulent, livid green, the lip faintly tinged with purple as is the tip of the column. 1923. *C. H. Lankester* 425: Province of San José, in the vicinity of El General, at 880 meters altitude. Flowers green; on tree over river. January 1936. *Alexander F. Skutch* 2431.

PANAMA: Department of Veragua, "on Mt. Chiriqui." *Warscewicz* s.n.

EXPLANATION OF THE ILLUSTRATION

EPIDENDRUM INCOMPTUM *Reichb.f.* Plant, one half natural size, drawn from *Skutch 2431*. 1, flower, enlarged. 2, column and labellum, enlarged. Figures 1 and 2 drawn, with the aid of the camera lucida, from specimens preserved in alcohol.

Drawn in August 1936 by BLANCHE AMES



EPIDENDRUM

incomptum

Reichb. f.



1636—1936

Reprinted November 1967